

1. A flywheel uninterruptible power source comprised of an energy storage flywheel supported for rotation on a bearing system and accelerated and decelerated using a brushless motor/generator for storing and retrieving energy,

5 said flywheel uninterruptible power source prevents interruption of power to an electrical load during an interruption of primary power by supplying power generated from the flywheel generator,

said flywheel is accelerated to normal operating speed using power from an alternating current primary source,

10 said power from said primary source is rectified to direct current power which is supplied to an synchronous inverter that accelerates the motor,

said direct current power supplied to the inverter is regulated by using switching regulation of the alternating current from the primary source for controlling the acceleration of the flywheel.

15 2. A flywheel uninterruptible power source as described in claim 1 wherein said switching regulation occurs at zero voltage.

20 3. A flywheel uninterruptible power source as described in claim 1 wherein said switching regulation occurs at zero current.

4. A flywheel uninterruptible power source as described in claim 1 wherein said switching regulation uses phase angle switching.

25 5. A flywheel uninterruptible power source as described in claim 1 wherein said switching regulation uses demand oriented transfer zero crossover firing.

6. A flywheel uninterruptible power source as described in claim 1 wherein said switching regulation is done using thryistors.

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7. A flywheel uninterruptible power source as described in claim 1 wherein said switching regulation is done using triacs.

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8. A flywheel uninterruptible power source as described in claim 1 wherein said direct current supplied to the inverter also powers magnetic bearings that support of the flywheel.

9. A flywheel uninterruptible power source as described in claim 1 wherein said flywheel is supported for rotation using passive radial magnetic bearings.

10 10. A flywheel uninterruptible power source as described in claim 1 wherein said inverter for accelerating the motor is sensorless.

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11. A flywheel uninterruptible power source as described in claim 1 wherein said motor/generator is a permanent magnet synchronous machine.

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12. A flywheel uninterruptible power source as described in claim 1 wherein said motor/generator is comprised of a separate motor and generator.

20 13. A flywheel uninterruptible power source as described in claim 1 wherein said flywheel is constructed mostly or exclusively of steel.

14. A flywheel uninterruptible power source comprised of an energy storage flywheel supported for rotation on a bearing system and accelerated and decelerated using a brushless motor/generator for storing and retrieving energy,

25 said flywheel uninterruptible power source prevents interruption of power to an electrical load during an interruption of primary power by supplying power generated from the flywheel generator,

 said flywheel is accelerated to normal operating speed using power from an alternating current primary source,

said power from said primary source is rectified to direct current power which is supplied to an synchronous inverter that accelerates the motor,

said direct current power supplied to the inverter is regulated by using switching regulation at a frequency below 200 Hz for controlling the acceleration of the flywheel.

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15. A flywheel uninterruptible power source comprised of an energy storage flywheel supported for rotation on a bearing system and accelerated and decelerated using a brushless motor/generator for storing and retrieving energy,

10 said flywheel uninterruptible power source prevents interruption of power to an electrical load during an interruption of primary power by supplying power generated from the flywheel generator,

15 said flywheel is accelerated to normal operating speed using power from an alternating current primary source,

20 said power from said primary source is rectified to direct current power which is supplied to an synchronous inverter that accelerates the motor,

25 said direct current power is increased to a level 1.5 or more times greater than the voltage of said alternating current primary source.

16. A flywheel uninterruptible power source as described in claim 15 wherein the voltage
20 level of said direct current power is increased by using a voltage-multiplying rectifier with the alternating current primary power.

17. A flywheel uninterruptible power source as described in claim 15 wherein the voltage
25 level of said direct current power is increased by using a step up transformer with the alternating current primary power.

18. A flywheel uninterruptible power source comprised of an energy storage flywheel supported for rotation on a bearing system and accelerated and decelerated using a brushless motor/generator for storing and retrieving energy,

said flywheel uninterruptible power source prevents interruption of power to an electrical load during an interruption of primary power by supplying power generated from the flywheel generator,

said flywheel is contained inside a low pressure container,

5 said flywheel is accelerated by a charging system that prevents acceleration of the flywheel if drag on said flywheel is above a predetermined level.

19. A flywheel uninterruptible power source as described in claim 18 wherein the drag on the flywheel is determined by the acceleration of the flywheel at a given speed and charging current.

20. A flywheel uninterruptible power source as described in claim 19 wherein a digital signal processor is used to determine if said drag on said flywheel is above said predetermined level.

21. A flywheel uninterruptible power source as described in claim 18 wherein said predetermined level of drag, above which acceleration of the flywheel is prevented, is higher for higher flywheel speeds.

20 22. A flywheel uninterruptible power source as described in claim 18 wherein the flywheel is slowed if the drag on the flywheel is too high.

23. A flywheel uninterruptible power source as described in claim 18 wherein an alarm is triggered if said drag on said flywheel is above said predetermined level.

25 24. A charging system as described in claim 18 wherein said drag on the flywheel is determined by said charging power or current to maintain speed.

30 25. A flywheel uninterruptible power source as described in claim 18 wherein said flywheel power system is charged by using power from an alternating current primary source.

26. A flywheel uninterruptible power source comprised of an energy storage flywheel supported for rotation on a bearing system and accelerated and decelerated using a brushless motor/generator for storing and retrieving energy,

5 said flywheel uninterruptible power source prevents interruption of power to an electrical load during an interruption of primary power by supplying power generated from the flywheel generator,

 said flywheel is accelerated to normal operating speed using power from an alternating current primary source,

10 said power from said primary source is rectified to direct current power which is supplied to a motor drive circuit that accelerates the motor,

 said direct current power supplied to the motor drive circuit is regulated by using switching regulation of the alternating current from the primary source for controlling the acceleration of the flywheel.

15 27. A flywheel uninterruptible power source as described in claim 26 wherein the motor drive circuit supplies single direction current to the motor coils.